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CLAIMS

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(57) [Utility model registration claim]
[Claim 1] The common suction port is formed in the cylinder head to the inlet valve which makes a pair while each gas column possesses the inlet valve of a pair. The suction port of this community has branched in the 1st port section and the 2nd port section by the septum [near the inlet valve]. In the Taki cylinder internal combustion engine stationed in the assembly body with which the inhalation-of-air control valve which controls the inflow of the inhalation air to this 1st port section was inserted between the cylinder head and an inlet manifold The suction system of the Taki cylinder internal combustion engine which the above-mentioned assembly body was inserted into the suction port of each community, respectively, and possessed the insertion section which does not form the above-mentioned septum and the septum which aligns, and has arranged the inhalation-of-air control valve to each insertion circles, respectively.

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DETAILED DESCRIPTION

[Detailed explanation of a design]
[Industrial Application]
This design is related with the Taki cylinder internal combustion engine's suction system.
[Description of the Prior Art]
The common inlet port is formed in the cylinder head to the inlet valve which makes a pair while each cylinder possesses the inlet valve of a couple. The common inlet port has branched in the 1st port section and the 2nd port section by the septum [near the inlet valve]. The Taki cylinder internal combustion engine stationed in the assembly body with which the inhalation-of-air control valve which controls the inflow of the inhalation air to the 1st port section was inserted between the cylinder head and an inlet manifold is well-known (refer to JP,59-192825,A or JP,61-5332,U).
That is, since passage resistance will become large if the inlet port which became independent thoroughly to each inlet valve in the internal combustion engine possessing the inlet valve of a couple, respectively is prepared, it becomes difficult to acquire a high charging efficiency at the time of engine high-speed heavy load operation. Therefore, in order to make passage resistance small, as mentioned above, a common inlet port is usually prepared to the inlet valve of a couple, and the common inlet port is made to branch in the 1st port section and the 2nd port section by the septum [near the inlet valve] in the internal combustion engine possessing the inlet valve of a couple.
On the other hand, generating a powerful turning style equips the combustion chamber with the inhalation-of-air control valve by the above-mentioned Taki cylinder internal combustion engine preferably therefore by making inhalation air flow into a combustion chamber at the time of engine low load driving, one the port section, for example, 2nd port section.
[Problem(s) to be Solved by the Device]
However, in the above-mentioned Taki cylinder internal combustion engine, each inhalation-of-air control valve is arranged from the assembly easy of an inhalation-of-air control valve in the assembly body in which it was inserted between the cylinder head and an inlet manifold. However, when an inhalation-of-air control valve is arranged in the assembly body in this way, an inhalation-of-air control valve cannot close the 1st port section, but inhalation air will flow into a combustion chamber from the both sides of the 1st port section and the 2nd port section thus also at the time of engine low load driving. Consequently, the problem that a powerful turning style cannot be generated is in a combustion chamber at the time of engine low load driving.
[The means for solving a technical problem]
The common inlet port is formed in the cylinder head to the inlet valve which makes a pair while each cylinder possesses the inlet valve of a couple according to this design, in order to solve the above-mentioned trouble. The common inlet port has branched in the 1st port section and the 2nd port section by the septum [near the inlet valve]. In the Taki cylinder internal combustion engine stationed in the assembly body with which the inhalation-of-air control valve which controls the inflow of the inhalation air to the 1st port section was inserted between the cylinder head and inhalation-of-air MANIHORU The assembly body was inserted into the inlet port of each community, respectively, and the insertion section which does not form the above-mentioned septum and the septum which aligns was provided, and the inhalation-of-air control valve is arranged to each insertion circles, respectively.
[Function]
The 1st port section which corresponds by each inhalation-of-air control valve can be closed now.
[Example]

With reference to drawing 7 , the 1st example is explained from drawing 1 .
Drawing 1 is a 4-cylinder internal combustion engine's top view. When drawing 1 is referred to, as for the cylinder head, and 2-5, 1 shows the exhaust port where the 1st to 4th cylinder, and 6-9 were formed in the exhaust valve, and 10-13 were formed in the cylinder head 1, respectively. In five, the 1st inlet valve 14-17 and the 2nd inlet valve 18-21 are arranged from each cylinder 2. It reaches 1st cylinder 2, and in 4, it reaches 2nd cylinder 3, and in 5, the 1st inlet valve 14 and 16 and the 2nd inlet valve 18 and 20 are arranged similarly, and the 4th cylinder of the 3rd cylinder of the 3rd cylinder of the 1st inlet valve 15 and 17 and the 2nd inlet valve 19 and 21 are arranged [it reaches 1st cylinder 2 and] at the 1st inlet valve 14 and 16 and the 2nd inlet valve 18 and 20, and the position of symmetry of 4. Corresponding to each 1st inlet valve 14-17, the straight ports 22-25 which are the 1st port sections are formed in the cylinder head 1, and the helical ports 26-29 which are the 2nd port sections are formed in it corresponding to each 2nd inlet valve 18-21. Each straight ports 22-25 and each helical ports 26-29 join, respectively, and turn into each common inlet ports 30-33. The common inlet ports 30-33 are connected to each branch pipes 35-38 of an inlet manifold through the port assembly 34 (refer to drawing 2).
drawing 3 -- some drawings 1 -- a cross-section side elevation is shown. If Figs. 1 and 3 are referred to, the port assembly 34 possesses each insertion sections 39-42 corresponding to each common inlet ports 30-33, and the assembly body 43 with which each insertion sections 39-42 are formed in one.
The front view of the assembly body 43 seen from the inlet-manifold side is shown in drawing 4 . If drawing 4 is referred to from drawing 1 , the 1st to 4th inhalation-of-air holes 44-47 will be formed in the assembly body 43. The 1st inhalation-of-air hole 44 and the 2nd inhalation-of-air hole 45 are aslant formed so that it may separate mutually toward the cylinder head 1. Moreover, the 3rd inhalation-of-air hole 46 is formed in the 1st inhalation-of-air hole 44 and parallel, and the 4th inhalation-of-air hole 47 is formed in the 2nd inhalation-of-air hole 45 and parallel, respectively. End-face 43a of the assembly body 43 and end-face 43b of an opposite hand in which the insertion sections 39-42 are formed are connected with each branch pipes 35-38 of an inlet manifold through a gasket 48. The configuration of opening 44a to 47a of each inhalation-of-air holes 44-47 on assembly body end-face 43b by the side of an inlet manifold is mostly formed in elliptical. On the other hand, the configuration of each inhalation-of-air holes 44-47 on end-face 43a of the side in which the insertion sections 39-42 are formed is mostly formed in the shape of a rectangle. The fuel injection valve insertion holes 49-52 which are open for free passage in 47 from each inhalation-of-air hole 44 are formed in the assembly body 43 upper part. Insertion arrangement of each fuel injection valve (not shown) is carried out into 52 from each fuel injection valve insertion hole 49.
Drawing which saw the port assembly 34 from the cylinder head side is shown in drawing 5 . If drawing 1 and Figs. 2 , 3 , and 5 are referred to, the appearance of the insertion sections 39-42 will be formed in the shape of a rectangular parallelepiped, and each connection ports 53-56 opened for free passage by the inhalation-of-air holes 44-47, respectively will be formed in 42 from each insertion section 39. The cross section of each connection ports 53-56 is an abbreviation rectangle-like, and each inhalation-of-air control valves 57-60 are arranged in 56 from each connection port 53. Each insertion sections 39-42 are prolonged in the slanting lower part to the assembly body 43 (refer to drawing 3). The cross-section configuration of each common inlet ports 30-33 has the shape of almost same rectangle as the cross-section configuration of each insertion sections 39-42, and each insertion sections 39-42 are inserted in 33 from each common inlet port 30. Since the inclination of each insertion sections 39-42 to the assembly body 43 is equal to the inclination of each common inlet ports 30-33 to end-face 1a (drawing 3) of the cylinder head 1 which counters the assembly body 43, it is stuck to assembly body end-face 43a and cylinder head end-face 1a through a gasket 61 (refer to drawing 3). Moreover, the clearance between each common inlet ports 30-33 and the insertion sections 39-42 is filled up with the heat-resistant outstanding liquefied gasket etc.
Figs. 3 and 6 -- drawing 1 -- 5 [cylinder / 4th] is shown. If Figs. 3 and 6 are referred to, the inhalation-of-air control valve 60 possesses the valve element 63 by which the stop was ****ed and carried out in the valve stem 62 supported by bottom wall 42a of the insertion section 42, and a valve stem 62. A valve stem 62 is arranged near the head opening of the insertion section 42. A valve element 63 is a rectangle-like and its height of a valve element 63 is almost equal to the height of the connection port 56. The valve element 63 is attached in the valve stem 62 so that the die length from a valve stem 62 to upper edge 63b of a valve element 63 may become twice [about] the die length from a valve stem 62 to down-stream edge 63a of a valve element 63. In drawing 6 , a valve element 63 serves as the side attachment walls 42c and 42d of the insertion section 42, and a parallel location at the time of inhalation-of-air control valve 60 valve opening (shown by the two-dot chain line in drawing 6), and down-stream edge 63a of a valve element 63 projects in the method of outside from the insertion

section 42, and is stopped by the septum 64 of a helical port 29 and the straight port 25. Therefore, at this time, inhalation of air flows into a combustion chamber from the straight port 25 and the swirl port 29. On the other hand, upper edge 63b of a valve element 63 engages with 42d of side attachment walls of the insertion section 42 at the time of inhalation-of-air control valve 60 clausilium (shown by the continuous line in drawing 6 R> drawing), and the down-stream edge 63 projects in the swirl port 29. For this reason, clausilium of the straight port 25 will be carried out, and since inhalation of air flows into a combustion chamber through the swirl port 29, a powerful swirl generates it in a combustion chamber. Since the valve element 63 inclines so that inhalation of air may flow smoothly toward the swirl port 29, it can make the charging efficiency of inhalation air improve. Moreover, since the input of the swirl port 29 is extracted while an eddy occurs between a septum 64 and valve element down-stream edge 63a, since down-stream edge 63a of a valve element 63 projects in the swirl port 29, the rate of flow of inhalation of air can increase, and atomization of a fuel can be made to improve thus.
When drawing 3 is referred to, a valve stem 62 penetrates the hole formed in bottom wall 42a of the insertion section 42, is supported by bottom wall 42a through a dust seal 71, and is ******(ed) by the nut 66 with a fastener 65. In order to make a valve stem 62 and a fastener 65 project, the notching section 67 is formed in the bottom wall of the common inhalation port 56 of the cylinder head 1 (refer to Figs. 3 and 6).
The bottom view of the port assembly 34 of drawing 5 is shown in drawing 7 . If Figs. 5 and 7 are referred to, each fastener 65 is connected with the link 68, and the left end of a link 68 is connected with the actuator 70 by the pin 69. an actuator 70 -- diaphram -- building -- **** -- the negative pressure of an inlet manifold -- a link 68 -- the direction (the valve-opening direction) of H in drawing 5 -- or you make it displace in the direction of C (the direction of clausilium) A link 68 is made into a zigzag configuration as shown in drawing 7 , and a fastener 65 is alternately connected with a link 68. The inhalation-of-air control valves 57-60 are in the clausilium location shown in Figs. 5 and 7 at the time of an engine low load and an inside load. Displacing a link 68 in the direction of H at the time of engine heavy load operation, thereby, around each valve stem 62, it rotates in the direction of the arrow head M in drawing 7 , and each inhalation-of-air control valves 57-60 serve as a valve-opening location. Thus, since the fastener 65 was alternately connected with the link 68, using the zigzag-like link 68, all the inhalation-of-air control valves 57-60 are controllable by the single link 68.
When attaching an inhalation-of-air control valve in the inlet port in the cylinder head like before, in order to make the seal nature by the inhalation-of-air control valve improve since there is a problem that the strength of a swirl falls when the clearance between an inlet port and an inhalation-of-air control valve is large, although it is necessary to make the process tolerance in an inlet port improve, it is difficult to raise the process tolerance of the inlet port in the cylinder head. Although it is necessary to raise the process tolerance of the connection ports 53-56 of the port assembly 34 in this example, since this processing is comparatively easy, desired process tolerance can be acquired. Moreover, a valve element 63 is about 1-2mm thin meat, it hits on the occasion of attachment from the connection port 53 to into 56, and the price is performed. For this reason, the clearance between each valve element 63 and the connection ports 53-56 can be made small, and a more powerful swirl style can be obtained by this.
Moreover, since it is what inserts into 33 the insertion sections 39-42 in which the inhalation-of-air control valves 57-60 were included from the common inlet port 30, the inhalation-of-air control valves 57-60 can be arranged in the location near [before] a combustion chamber, and, thereby, a swirl can be strengthened further.
Moreover, after inserting a valve stem 62 from the breakthrough of insertion section bottom wall 42a in drawing 3 in attachment of this example, Since the attachment activity of the inhalation-of-air control valves 57-60 to an engine is completed by ****ing and carrying out the stop of the valve element 63 to a valve stem 62, and inserting each insertion sections 39-42 into 33 from the common inlet port 30, the attachment workability of the inhalation-of-air control valves 57-60 to an engine can be made to improve.
With reference to drawing 10, the 2nd example is explained from drawing 8 . If the 2nd example removes the point which has a link system for driving an inhalation-of-air control valve above the cylinder head, it is the same as the 1st example almost. In addition, the same sign shows the same component as the 1st example.
If Figs. 8 and 9 are referred to, a breakthrough will be formed in upper wall 42b of the insertion section 42, and a valve stem 62 will penetrate this insertion hole. It is attached in valve-stem 62 upper bed so that the end of the 1st link arm 81 may a valve stem 62 and really rotate through a washer 80. As shown in drawing 10, after accumulating the end of the 1st link arm 81, the color 82 made of resin, and the 2nd link arm 83, the color 84 made of resin, and WASSHU 85 in an order from the bottom and penetrating a pin 86 to these, the other end of the 1st link arm 81 attaches E ring 87 on a washer 85, and falls out, and a stop is carried out. Therefore, revolution displacement is relatively [the 1st link arm 81 and the 2nd link arm 83 / mutual] possible.

The subshaft 88 is arranged at the assembly body 43. The soffit of the subshaft 88 is supported by the bottom wall of the assembly body 43 through bearing 89, and the upper bed of the subshaft 88 penetrates the top wall of the assembly body 43, and is supported by the top wall through the dust seal 90. The axis of a valve stem 62 and the axis of the subshaft 88 are parallel, and the flat surface containing these axes is vertical to the straight line L (drawing 8) which connects the central point of each subshaft 88. It is attached in the upper bed of the subshaft 88 so that the end and fastener 65 of the 3rd link arm 91 may really rotate through a washer 92. The other end of the 2nd link arm 83 is mutually connected with the other end of the 3rd link arm 91 rotatable by the pin 86 through the color 84 made of resin like drawing 10. The 1st link arm 81 and the 3rd link arm 91 are arranged so that die length may become it is equal and parallel. A fastener 65 is connected with a link 68. If drawing 8 shows the condition that the valve element 63 is closing the valve and a link displaces it in the direction of the 68 arrow heads H, it rotates in the direction shown by the arrow head M, and a valve element 63 will be in a valve-opening condition.

the inhalation-of-air system deposit by blow-by gas etc. since the link mechanism was established above the cylinder head 1 in this example -- the bottom wall in a connection port -- depositing -- closing motion of an inhalation-of-air control valve -- ******** -- things can be prevented.

Moreover, there is also no possibility that a link system may be thrown at a ground surface etc. and it may be damaged at the time of haulage after assembling a port assembly.

The 3rd example is shown in drawing 11. The inhalation-of-air control valve serves as the throttle valve in this example. The link mechanism for driving an inhalation-of-air control valve is the same Section 4 link mechanism as the 2nd example. A link 68 is connected with an accelerator pedal 100 rather than is driven with the actuator 70 of negative pressure actuation like the 1st and 2nd examples, and carries out actuation displacement according to the amount of treading in of an accelerator pedal 100. If an accelerator pedal 100 is broken in, a link 68 is displaced in the direction of H in drawing 11, a valve element 63 will be displaced in the direction of M in drawing 11, and an opening will increase. The width of face W of a valve element 63 is larger than the 1st and 2nd examples, and let the connection port 56 be the width of face in which a close by-pass bulb completely is possible. a valve stem 62 -- the width of face W of a valve element 63 -- it is located mostly right in the middle. When the amount of treading in of an accelerator pedal 100 is 0, a valve element 63 carries out the close by-pass bulb completely of the connection port 56 at the time of idle operation. At this time, down-stream edge 63a of a valve element 63 engages with the insertion section side-attachment-wall 42c wall by the side of a helical port 29, and upper edge 63b of a valve element 63 engages with 42d wall of insertion section side attachment walls by the side of the straight port 25. In addition, in order to adjust the air content at the time of idle operation, the bypass path (not shown) which bypasses the inhalation-of-air control valve 60, and is opened for free passage by the helical port 29 is formed. On 42d internal surface of the straight port 25 side insertion section side attachment walls, 42f of projecting flat-surface sections following gryposis section 42e formed by a part of cylinder side and this gryposis section 42e is formed. This gryposis section 42e is formed so that valve element upstream edge 63b may rotate along with gryposis section 42e. Thereby, the straight port 25 side is maintained in the clausilium condition by gryposis section 42e and 42f of flat-surface sections at the time of a partial load with the small amount of treading in of an accelerator pedal 100. Therefore, new mind can flow into a combustion chamber only from a helical port 29 at the time of a partial load, and a powerful swirl can be thus obtained to a combustion chamber. Moreover, in case it begins to break in an accelerator pedal 100 and a valve element 63 begins to open by forming gryposis section 42e and 42f of flat-surface sections, it can prevent that air begins to flow rapidly. Thereby, it can prevent that adjustment of the amount of treading in of an accelerator pedal 100 becomes difficult at the time of low-speed transit.

Also in other insertion sections 39-41, it is formed like the insertion section 42.

In this example, the inhalation-of-air control valve serves also as the throttle valve as the so-called independent throttle valve as mentioned above, therefore it is not necessary to prepare a throttle valve apart from an inhalation-of-air control valve. For this reason, buildup of inhalation-of-air loss can be prevented.

Moreover, since the space volume between an inlet valve and an inhalation-of-air control valve (throttle valve) can be made small, transient response nature can be made to improve.

In addition, by changing die length, a setting angle, etc. of the 1st link arm 81 and the 3rd link arm 91, change of the opening of a valve element 63 to change of the amount of treading in of an accelerator pedal 100 can be changed, and the drivability at the time of low r.p.m. operation can be improved.

In addition, this design can be applied also when the single inlet port corresponding to one inlet valve is divided into the helical port and the straight port.

[Effect of the Device]
A powerful turning style can be made to generate at the time of engine low load driving, making the installation workability to the engine of an inhalation-of-air control valve improve. Furthermore, since he is trying not to form a septum in the insertion circles of the assembly body, there is an advantage that manufacture of the assembly body is easy. Moreover, if a septum is formed in the insertion circles of the assembly body, it will be necessary to make it align so that the septum and level difference which were formed in the inlet port cannot do this septum, and, as a result, a high precision will be required from manufacture of the assembly body, and shaping of an inlet port. However, in this application design, since he is trying not to form a septum in the insertion circles of the assembly body, there is an advantage that so high a precision is not required from manufacture of the assembly body and shaping of an inlet port.

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TECHNICAL FIELD

[Industrial Application]
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PRIOR ART

[Description of the Prior Art]
The common inlet port is formed in the cylinder head to the inlet valve which makes a pair while each cylinder possesses the inlet valve of a couple. The common inlet port has branched in the 1st port section and the 2nd port section by the septum [near the inlet valve]. The Taki cylinder internal combustion engine stationed in the assembly body with which the inhalation-of-air control valve which controls the inflow of the inhalation air to the 1st port section was inserted between the cylinder head and an inlet manifold is well-known (refer to JP,59-192825,A or JP,61-5332,U).
That is, since passage resistance will become large if the inlet port which became independent thoroughly to each inlet valve in the internal combustion engine possessing the inlet valve of a couple, respectively is prepared, it becomes difficult to acquire a high charging efficiency at the time of engine high-speed heavy load operation. Therefore, in order to make passage resistance small, as mentioned above, a common inlet port is usually prepared to the inlet valve of a couple, and the common inlet port is made to branch in the 1st port section and the 2nd port section by the septum [near the inlet valve] in the internal combustion engine possessing the inlet valve of a couple.
On the other hand, generating a powerful turning style equips the combustion chamber with the inhalation-of-air control valve by the above-mentioned Taki cylinder internal combustion engine preferably therefore by making inhalation air flow into a combustion chamber at the time of engine low load driving, one the port section, for example, 2nd port section.

[Translation done.]

EFFECT OF THE INVENTION

[Effect of the Device]
A powerful turning style can be made to generate at the time of engine low load driving, making the installation workability to the engine of an inhalation-of-air control valve improve. Furthermore, since he is trying not to form a septum in the insertion circles of the assembly body, there is an advantage that manufacture of the assembly body is easy. Moreover, if a septum is formed in the insertion circles of the assembly body, it will be necessary to make it align so that the septum and level difference which were formed in the inlet port cannot do this septum, and, as a result, a high precision will be required from manufacture of the assembly body, and shaping of an inlet port. However, in this application design, since he is trying not to form a septum in the insertion circles of the assembly body, there is an advantage that so high a precision is not required from manufacture of the assembly body and shaping of an inlet port.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Device]
However, in the above-mentioned Taki cylinder internal combustion engine, each inhalation-of-air control valve is arranged from the assembly easy of an inhalation-of-air control valve in the assembly body in which it was inserted between the cylinder head and an inlet manifold. However, when an inhalation-of-air control valve is arranged in the assembly body in this way, an inhalation-of-air control valve cannot close the 1st port section, but inhalation air will flow into a combustion chamber from the both sides of the 1st port section and the 2nd port section thus also at the time of engine low load driving. Consequently, the problem that a powerful turning style cannot be generated is in a combustion chamber at the time of engine low load driving.

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MEANS

[The means for solving a technical problem]
The common inlet port is formed in the cylinder head to the inlet valve which makes a pair while each cylinder possesses the inlet valve of a couple according to this design, in order to solve the above-mentioned trouble. The common inlet port has branched in the 1st port section and the 2nd port section by the septum [near the inlet valve]. In the Taki cylinder internal combustion engine stationed in the assembly body with which the inhalation-of-air control valve which controls the inflow of the inhalation air to the 1st port section was inserted between the cylinder head and inhalation-of-air MANIHORU The assembly body was inserted into the inlet port of each community, respectively, and the insertion section which does not form the above-mentioned septum and the septum which aligns was provided, and the inhalation-of-air control valve is arranged to each insertion circles, respectively.

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OPERATION

[Function]
The 1st port section which corresponds by each inhalation-of-air control valve can be closed now.

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EXAMPLE

[Example]
With reference to drawing 7 , the 1st example is explained from drawing 1 .
Drawing 1 is a 4-cylinder internal combustion engine's top view. When drawing 1 is referred to, as for the cylinder head, and 2-5, 1 shows the exhaust port where the 1st to 4th cylinder, and 6-9 were formed in the exhaust valve, and 10-13 were formed in the cylinder head 1, respectively. In five, the 1st inlet valve 14-17 and the 2nd inlet valve 18-21 are arranged from each cylinder 2. It reaches 1st cylinder 2, and in 4, it reaches 2nd cylinder 3, and in 5, the 1st inlet valve 14 and 16 and the 2nd inlet valve 18 and 20 are arranged similarly, and the 4th cylinder of the 3rd cylinder of the 3rd cylinder of the 1st inlet valve 15 and 17 and the 2nd inlet valve 19 and 21 are arranged [it reaches 1st cylinder 2 and] at the 1st inlet valve 14 and 16 and the 2nd inlet valve 18 and 20, and the position of symmetry of 4. Corresponding to each 1st inlet valve 14-17, the straight ports 22-25 which are the 1st port sections are formed in the cylinder head 1, and the helical ports 26-29 which are the 2nd port sections are formed in it corresponding to each 2nd inlet valve 18-21. Each straight ports 22-25 and each helical ports 26-29 join, respectively, and turn into each common inlet ports 30-33. The common inlet ports 30-33 are connected to each branch pipes 35-38 of an inlet manifold through the port assembly 34 (refer to drawing 2).
drawing 3 -- some drawings 1 -- a cross-section side elevation is shown. If Figs. 1 and 3 are referred to, the port assembly 34 possesses each insertion sections 39-42 corresponding to each common inlet ports 30-33, and the assembly body 43 with which each insertion sections 39-42 are formed in one.
The front view of the assembly body 43 seen from the inlet-manifold side is shown in drawing 4 . If drawing 4 is referred to from drawing 1 , the 1st to 4th inhalation-of-air holes 44-47 will be formed in the assembly body 43. The 1st inhalation-of-air hole 44 and the 2nd inhalation-of-air hole 45 are aslant formed so that it may separate mutually toward the cylinder head 1. Moreover, the 3rd inhalation-of-air hole 46 is formed in the 1st inhalation-of-air hole 44 and parallel, and the 4th inhalation-of-air hole 47 is formed in the 2nd inhalation-of-air hole 45 and parallel, respectively. End-face 43a of the assembly body 43 and end-face 43b of an opposite hand in which the insertion sections 39-42 are formed are connected with each branch pipes 35-38 of an inlet manifold through a gasket 48. The configuration of opening 44a to 47a of each inhalation-of-air holes 44-47 on assembly body end-face 43b by the side of an inlet manifold is mostly formed in elliptical. On the other hand, the configuration of each inhalation-of-air holes 44-47 on end-face 43a of the side in which the insertion sections 39-42 are formed is mostly formed in the shape of a rectangle. The fuel injection valve insertion holes 49-52 which are open for free passage in 47 from each inhalation-of-air hole 44 are formed in the assembly body 43 upper part. Insertion arrangement of each fuel injection valve (not shown) is carried out into 52 from each fuel injection valve insertion hole 49.
Drawing which saw the port assembly 34 from the cylinder head side is shown in drawing 5 . If drawing 1 and Figs. 2 , 3 , and 5 are referred to, the appearance of the insertion sections 39-42 will be formed in the shape of a rectangular parallelepiped, and each connection ports 53-56 opened for free passage by the inhalation-of-air holes 44-47, respectively will be formed in 42 from each insertion section 39. The cross section of each connection ports 53-56 is an abbreviation rectangle-like, and each inhalation-of-air control valves 57-60 are arranged in 56 from each connection port 53. Each insertion sections 39-42 are prolonged in the slanting lower part to the assembly body 43 (refer to drawing 3). The cross-section configuration of each common inlet ports 30-33 has the shape of almost same rectangle as the cross-section configuration of each insertion sections 39-42, and each insertion sections 39-42 are inserted in 33 from each common inlet port 30. Since the inclination of each insertion sections 39-42 to the assembly body 43 is equal to the inclination of each common inlet ports 30-33 to end-face 1a (drawing 3) of the cylinder head 1 which counters the assembly body 43, it is stuck to assembly body end-

face 43a and cylinder head end-face 1a through a gasket 61 (refer to drawing 3). Moreover, the clearance between each common inlet ports 30-33 and the insertion sections 39-42 is filled up with the heat-resistant outstanding liquefied gasket etc.
Figs. 3 and 6 -- drawing 1 -- 5 [cylinder / 4th] is shown. If Figs. 3 and 6 are referred to, the inhalation-of-air control valve 60 possesses the valve element 63 by which the stop was ****ed and carried out in the valve stem 62 supported by bottom wall 42a of the insertion section 42, and a valve stem 62. A valve stem 62 is arranged near the head opening of the insertion section 42. A valve element 63 is a rectangle-like and its height of a valve element 63 is almost equal to the height of the connection port 56. The valve element 63 is attached in the valve stem 62 so that the die length from a valve stem 62 to upper edge 63b of a valve element 63 may become twice [about] the die length from a valve stem 62 to down-stream edge 63a of a valve element 63. In drawing 6 , a valve element 63 serves as the side attachment walls 42c and 42d of the insertion section 42, and a parallel location at the time of inhalation-of-air control valve 60 valve opening (shown by the two-dot chain line in drawing 6), and down-stream edge 63a of a valve element 63 projects in the method of outside from the insertion section 42, and is stopped by the septum 64 of a helical port 29 and the straight port 25. Therefore, at this time, inhalation of air flows into a combustion chamber from the straight port 25 and the swirl port 29. On the other hand, upper edge 63b of a valve element 63 engages with 42d of side attachment walls of the insertion section 42 at the time of inhalation-of-air control valve 60 clausilium (shown by the continuous line in drawing 6 R> drawing), and the down-stream edge 63 projects in the swirl port 29. For this reason, clausilium of the straight port 25 will be carried out, and since inhalation of air flows into a combustion chamber through the swirl port 29, a powerful swirl generates it in a combustion chamber. Since the valve element 63 inclines so that inhalation of air may flow smoothly toward the swirl port 29, it can make the charging efficiency of inhalation air improve. Moreover, since the input of the swirl port 29 is extracted while an eddy occurs between a septum 64 and valve element down-stream edge 63a, since down-stream edge 63a of a valve element 63 projects in the swirl port 29, the rate of flow of inhalation of air can increase, and atomization of a fuel can be made to improve thus.
When drawing 3 is referred to, a valve stem 62 penetrates the hole formed in bottom wall 42a of the insertion section 42, is supported by bottom wall 42a through a dust seal 71, and is ******(ed) by the nut 66 with a fastener 65. In order to make a valve stem 62 and a fastener 65 project, the notching section 67 is formed in the bottom wall of the common inhalation port 56 of the cylinder head 1 (refer to Figs. 3 and 6).
The bottom view of the port assembly 34 of drawing 5 is shown in drawing 7 . If Figs. 5 and 7 are referred to, each fastener 65 is connected with the link 68, and the left end of a link 68 is connected with the actuator 70 by the pin 69. an actuator 70 -- diaphram -- building -- **** -- the negative pressure of an inlet manifold -- a link 68 -- the direction (the valve-opening direction) of H in drawing 5 -- or you make it displace in the direction of C (the direction of clausilium) A link 68 is made into a zigzag configuration as shown in drawing 7 , and a fastener 65 is alternately connected with a link 68. The inhalation-of-air control valves 57-60 are in the clausilium location shown in Figs. 5 and 7 at the time of an engine low load and an inside load. Displacing a link 68 in the direction of H at the time of engine heavy load operation, thereby, around each valve stem 62, it rotates in the direction of the arrow head M in drawing 7 , and each inhalation-of-air control valves 57-60 serve as a valve-opening location. Thus, since the fastener 65 was alternately connected with the link 68, using the zigzag-like link 68, all the inhalation-of-air control valves 57-60 are controllable by the single link 68.
When attaching an inhalation-of-air control valve in the inlet port in the cylinder head like before, in order to make the seal nature by the inhalation-of-air control valve improve since there is a problem that the strength of a swirl falls when the clearance between an inlet port and an inhalation-of-air control valve is large, although it is necessary to make the process tolerance in an inlet port improve, it is difficult to raise the process tolerance of the inlet port in the cylinder head. Although it is necessary to raise the process tolerance of the connection ports 53-56 of the port assembly 34 in this example, since this processing is comparatively easy, desired process tolerance can be acquired. Moreover, a valve element 63 is about 1-2mm thin meat, it hits on the occasion of attachment from the connection port 53 to into 56, and the price is performed. For this reason, the clearance between each valve element 63 and the connection ports 53-56 can be made small, and a more powerful swirl style can be obtained by this.
Moreover, since it is what inserts into 33 the insertion sections 39-42 in which the inhalation-of-air control valves 57-60 were included from the common inlet port 30, the inhalation-of-air control valves 57-60 can be arranged in the location near [before] a combustion chamber, and, thereby, a swirl can be strengthened further.
Moreover, after inserting a valve stem 62 from the breakthrough of insertion section bottom wall 42a in drawing 3 in attachment of this example, Since the attachment activity of the inhalation-of-air control valves 57-60 to an

engine is completed by ****ing and carrying out the stop of the valve element 63 to a valve stem 62, and inserting each insertion sections 39-42 into 33 from the common inlet port 30, the attachment workability of the inhalation-of-air control valves 57-60 to an engine can be made to improve.

With reference to drawing 10, the 2nd example is explained from drawing 8 . If the 2nd example removes the point which has a link system for driving an inhalation-of-air control valve above the cylinder head, it is the same as the 1st example almost. In addition, the same sign shows the same component as the 1st example.

If Figs. 8 and 9 are referred to, a breakthrough will be formed in upper wall 42b of the insertion section 42, and a valve stem 62 will penetrate this insertion hole. It is attached in valve-stem 62 upper bed so that the end of the 1st link arm 81 may a valve stem 62 and really rotate through a washer 80. As shown in drawing 10, after accumulating the end of the 1st link arm 81, the color 82 made of resin, and the 2nd link arm 83, the color 84 made of resin, and WASSHU 85 in an order from the bottom and penetrating a pin 86 to these, the other end of the 1st link arm 81 attaches E ring 87 on a washer 85, and falls out, and a stop is carried out. Therefore, revolution displacement is relatively [the 1st link arm 81 and the 2nd link arm 83 / mutual] possible.

The subshaft 88 is arranged at the assembly body 43. The soffit of the subshaft 88 is supported by the bottom wall of the assembly body 43 through bearing 89, and the upper bed of the subshaft 88 penetrates the top wall of the assembly body 43, and is supported by the top wall through the dust seal 90. The axis of a valve stem 62 and the axis of the subshaft 88 are parallel, and the flat surface containing these axes is vertical to the straight line L (drawing 8) which connects the central point of each subshaft 88. It is attached in the upper bed of the subshaft 88 so that the end and fastener 65 of the 3rd link arm 91 may really rotate through a washer 92. The other end of the 2nd link arm 83 is mutually connected with the other end of the 3rd link arm 91 rotatable by the pin 86 through the color 84 made of resin like drawing 10. The 1st link arm 81 and the 3rd link arm 91 are arranged so that die length may become it is equal and parallel. A fastener 65 is connected with a link 68. If drawing 8 shows the condition that the valve element 63 is closing the valve and a link displaces it in the direction of the 68 arrow heads H, it rotates in the direction shown by the arrow head M, and a valve element 63 will be in a valve-opening condition.

the inhalation-of-air system deposit by blow-by gas etc. since the link mechanism was established above the cylinder head 1 in this example -- the bottom wall in a connection port -- depositing -- closing motion of an inhalation-of-air control valve -- ******** -- things can be prevented.

Moreover, there is also no possibility that a link system may be thrown at a ground surface etc. and it may be damaged at the time of haulage after assembling a port assembly.

The 3rd example is shown in drawing 11. The inhalation-of-air control valve serves as the throttle valve in this example. The link mechanism for driving an inhalation-of-air control valve is the same Section 4 link mechanism as the 2nd example. A link 68 is connected with an accelerator pedal 100 rather than is driven with the actuator 70 of negative pressure actuation like the 1st and 2nd examples, and carries out actuation displacement according to the amount of treading in of an accelerator pedal 100. If an accelerator pedal 100 is broken in, a link 68 is displaced in the direction of H in drawing 11, a valve element 63 will be displaced in the direction of M in drawing 11, and an opening will increase. The width of face W of a valve element 63 is larger than the 1st and 2nd examples, and let the connection port 56 be the width of face in which a close by-pass bulb completely is possible. a valve stem 62 -- the width of face W of a valve element 63 -- it is located mostly right in the middle. When the amount of treading in of an accelerator pedal 100 is 0, a valve element 63 carries out the close by-pass bulb completely of the connection port 56 at the time of idle operation. At this time, down-stream edge 63a of a valve element 63 engages with the insertion section side-attachment-wall 42c wall by the side of a helical port 29, and upper edge 63b of a valve element 63 engages with 42d wall of insertion section side attachment walls by the side of the straight port 25. In addition, in order to adjust the air content at the time of idle operation, the bypass path (not shown) which bypasses the inhalation-of-air control valve 60, and is opened for free passage by the helical port 29 is formed. On 42d internal surface of the straight port 25 side insertion section side attachment walls, 42f of projecting flat-surface sections following gryposis section 42e formed by a part of cylinder side and this gryposis section 42e is formed. This gryposis section 42e is formed so that valve element upstream edge 63b may rotate along with gryposis section 42e. Thereby, the straight port 25 side is maintained in the clausilium condition by gryposis section 42e and 42f of flat-surface sections at the time of a partial load with the small amount of treading in of an accelerator pedal 100. Therefore, new mind can flow into a combustion chamber only from a helical port 29 at the time of a partial load, and a powerful swirl can be thus obtained to a combustion chamber. Moreover, in case it begins to break in an accelerator pedal 100 and a valve element 63 begins to open by forming gryposis section 42e and 42f of flat-surface sections, it can prevent that air begins to flow rapidly.

Thereby, it can prevent that adjustment of the amount of treading in of an accelerator pedal 100 becomes difficult at the time of low-speed transit.
Also in other insertion sections 39-41, it is formed like the insertion section 42.
In this example, the inhalation-of-air control valve serves also as the throttle valve as the so-called independent throttle valve as mentioned above, therefore it is not necessary to prepare a throttle valve apart from an inhalation-of-air control valve. For this reason, buildup of inhalation-of-air loss can be prevented.
Moreover, since the space volume between an inlet valve and an inhalation-of-air control valve (throttle valve) can be made small, transient response nature can be made to improve.
In addition, by changing die length, a setting angle, etc. of the 1st link arm 81 and the 3rd link arm 91, change of the opening of a valve element 63 to change of the amount of treading in of an accelerator pedal 100 can be changed, and the drivability at the time of low r.p.m. operation can be improved.
In addition, this design can be applied also when the single inlet port corresponding to one inlet valve is divided into the helical port and the straight port.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
The top view of the 4-cylinder internal combustion engine with which drawing 1 applied the 1st example of this design, The internal combustion engine of drawing 1 the perspective view of a port assembly, and the 3rd drawing 3 drawing a part for drawing 2 A cross-section side elevation, The front view which saw the assembly body with which drawing 4 is shown in the 1st drawing 1 drawing from the inlet-manifold side, The front view with which drawing 5 saw the port assembly of drawing 1 from the cylinder head side, Drawing 6 the expanded sectional view of the 4th cylinder section of drawing 1 , and drawing 7 The bottom view of drawing 5 , the 8th drawing 8 drawing -- the amplification top view of the port assembly of the 2nd example, and drawing 9 -- the side-face sectional view of the port assembly of drawing 8 , and drawing 10 -- the expanded sectional view of the connection of a link arm, and drawing 11 -- a part of port assembly of the 3rd example -- it is the amplification top view of a cross section.
1 [.. A port assembly, 39-42 / .. The insertion section, 43 / .. The assembly body, 57-60 / .. Inhalation-of-air control valve] .... The cylinder head, 22-25 .. A straight port, 26-29 .. A helical port, 34

[Translation done.]

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(56)参考文献　特開昭60－147534（ＪＰ，Ａ）
実開昭52－22815（ＪＰ，Ｕ）
実公昭50－2906（ＪＰ，Ｙ2）

(54)【考案の名称】多気筒内燃機関の吸気装置

1

(57)【実用新案登録請求の範囲】

【請求項１】各気筒が一対の吸気弁を具備すると共に対をなす吸気弁に対して共通の吸気ポートがシリンダヘッド内に形成されており、該共通の吸気ポートが吸気弁の近傍において隔壁により第１ポート部と第２ポート部とに分岐されており、該第１ポート部への吸入空気の流入を制御する吸気制御弁がシリンダヘッドと吸気マニホルド間に挿入されたアッセンブリボディ内に配置されている多気筒内燃機関において、上記アッセンブリボディが各共通の吸気ポート内に夫々挿入されかつ上記隔壁と整列する隔壁を形成していない挿入部を具備し、各挿入部内に夫々吸気制御弁を配置した多気筒内燃機関の吸気装置。

【考案の詳細な説明】

〔産業上の利用分野〕

2

本考案は多気筒内燃機関の吸気装置に関する。

〔従来の技術〕

各気筒が一対の吸気弁を具備すると共に対をなす吸気弁に対して共通の吸気ポートがシリンダヘッド内に形成されており、共通の吸気ポートが吸気弁の近傍において隔壁により第１ポート部と第２ポート部とに分岐されており、第１ポート部への吸入空気の流入を制御する吸気制御弁がシリンダヘッドと吸気マニホルド間に挿入されたアッセンブリボディ内に配置されている多気筒内燃機関が公知である（特開昭59－192825号公報或いは実開昭61－5332号公報参照）。

即ち、一対の吸気弁を具備した内燃機関において各吸気弁に対し夫々完全に独立した吸気ポートを設けると流路抵抗が大きくなるために機関高速高負荷運転時に高い充填効率を得るのが困難となる。従って一対の吸気弁を

具備した内燃機関では流路抵抗を小さくするために通常、上述したように一対の吸気弁に対して共通の吸気ポートを設け、共通の吸気ポートを吸気弁の近傍において隔壁により第１ポート部と第２ポート部とに分岐するようにしている。

一方、機関低負荷運転時には一方のポート部、例えば第２ポート部のみから燃焼室内に吸入空気を流入させることによって燃焼室内に強力な旋回流を発生させることが好ましく、そのために上述の多気筒内燃機関では吸気制御弁を具えている。

〔考案が解決しようとする課題〕

しかしながら上述の多気筒内燃機関では吸気制御弁の組付けやすさから各吸気制御弁をシリンダヘッドと吸気マニホルド間に挿入されたアッセンブリボディ内に配置している。しかしながらこのようにアッセンブリボディ内に吸気制御弁を配置すると第１ポート部を吸気制御弁によって閉鎖することができず、斯くして機関低負荷運転時にも第１ポート部と第２ポート部の双方から吸入空気が燃焼室内に流入することになる。その結果、機関低負荷運転時に燃焼室内に強力な旋回流を発生することができないという問題がある。

〔課題を解決するための手段〕

上記問題点を解決するために本考案によれば、各気筒が一対の吸気弁を具備すると共に対をなす吸気弁に対して共通の吸気ポートがシリンダヘッド内に形成されており、共通の吸気ポートが吸気弁の近傍において隔壁により第１ポート部と第２ポート部とに分岐されており、第１ポート部への吸入空気の流入を制御する吸気制御弁がシリンダヘッドと吸気マニホル間に挿入されたアッセンブリボディ内に配置されている多気筒内燃機関において、アッセンブリボディが各共通の吸気ポート内に夫々挿入されかつ上述の隔壁と整列する隔壁を形成していない挿入部を具備し、各挿入部内に夫々吸気制御弁を配置している。

〔作用〕

各吸気制御弁によって対応する第１ポート部を閉鎖しうるようになる。

〔実施例〕

第１図から第７図を参照して第１の実施例について説明する。

第１図は４気筒内燃機関の平面図である。第１図を参照すると、１はシリンダヘッド、２から５は第１から第４気筒、６から９は排気弁、10から13はシリンダヘッド１内に形成された排気ポートを夫々示す。各気筒２から５内には第１吸気弁14から17および第２吸気弁18から21が配置される。第１気筒２および第３気筒４においては、第１吸気弁14，16および第２吸気弁18，20は同様に配置され、第２気筒３および第４気筒５においては、第１気筒２および第３気筒４の第１吸気弁14，16および第２吸気弁18，20と対称位置に第１吸気弁15，17および第２吸気弁19，21が配置される。シリンダヘッド１には、各第１吸気弁14から17に対応して第１ポート部であるストレートポート22から25が形成され、また各第２吸気弁18から21に対応して第２ポート部であるヘリカルポート26から29が形成される。各ストレートポート22から25および各ヘリカルポート26から29は夫々合流して各共通吸気ポート30から33となる。共通吸気ポート30から33はポートアッセンブリ34（第２図参照）を介して吸気マニホルドの各枝管35から38に接続される。

第３図は第１図の一部断面側面図を示す。第１図および第３図を参照すると、ポートアッセンブリ34は各共通吸気ポート30から33に対応する各挿入部39から42と、各挿入部39から42が一体に形成されるアッセンブリボディ43とを具備する。

第４図には吸気マニホルド側からみたアッセンブリボディ43の正面図を示す。第１図から第４図を参照すると、アッセンブリボディ43には第１から第４吸気孔44から47が形成される。第１吸気孔44および第２吸気孔45はシリンダヘッド１に向かって互いに離れるように斜めに形成されている。また、第３吸気孔46は第１吸気孔44と平行に、第４吸気孔47は第２吸気孔45と平行に夫々形成されている。挿入部39から42が形成されているアッセンブリボディ43の端面43aと反対側の端面43bはガスケット48を介して吸気マニホルドの各枝管35から38に連結される。吸気マニホルド側のアッセンブリボディ端面43b上における、各吸気孔44から47の開口44aから47aの形状はほぼ楕円形状に形成される。一方、挿入部39から42が形成されている側の端面43a上における各吸気孔44から47の形状はほぼ長方形状に形成されている。アッセンブリボディ43上部には各吸気孔44から47内に連通する燃料噴射弁挿入孔49から52が形成される。各燃料噴射弁（図示せず）は各燃料噴射弁挿入孔49から52内に挿入配置される。

第５図には、ポートアッセンブリ34をシリンダヘッド側からみた図を示す。第１図、第２図、第３図、および第５図を参照すると、挿入部39から42の外形は直方体状に形成され、各挿入部39から42内には吸気孔44から47に夫々連通された各接続ポート53から56が形成される。各接続ポート53から56の断面は略長方形状であり、各接続ポート53から56内には各吸気制御弁57から60が配置される。各挿入部39から42はアッセンブリボディ43に対して斜め下方に延びている（第３図参照）。各共通吸気ポート30から33の断面形状は各挿入部39から42の断面形状とほぼ同様の長方形状であり、各共通吸気ポート30から33内に各挿入部39から42が嵌入される。アッセンブリボディ43に対する各挿入部39から42の傾きはアッセンブリボディ43に対向するシリンダヘッド１の端面1a（第３図）に対する各共通吸気ポート30から33の傾きに等しいため、アッセンブリボディ端面43aとシリンダヘッド端面1aはガスケット61を介して密着される（第３図参照）。

また、各共通吸気ポート30から33と挿入部39から42との隙間には耐熱性の優れた液状のガスケット等が充填されている。

第３図および第６図は第１図の第４気筒５を示している。第３図および第６図を参照すると、吸気制御弁60は挿入部42の底壁42aに支持された弁軸62と、弁軸62に例えばねじ止めされた弁体63とを具備する。弁軸62は挿入部42の先端開口部近傍に配置される。弁体63は長方形状であり、弁体63の高さは接続ポート56の高さとほぼ等しい。弁体63は、弁軸62から弁体63の上流端63bまでの長さが、弁軸62から弁体63の下流端63aまでの長さの約２倍となるように弁軸62に取付けられている。第６図において、吸気制御弁60開弁時（第６図中二点鎖線で示される）においては、弁体63は挿入部42の側壁42c, 42dと平行方向位置となり、弁体63の下流端部63aは、挿入部42から外方に突出してヘリカルポート29とストレートポート25の隔壁64によって係止される。従ってこのときには吸気はストレートポート25およびスワールポート29から燃焼室内に流入する。一方、吸気制御弁60閉弁時（第６図で実線で示される）においては、弁体63の上流端63bは挿入部42の側壁42dに係合し、下流端部63はスワールポート29内に突出する。このためストレートポート25は閉弁されることとなり、吸気はスワールポート29を介して燃焼室内に流入するので燃焼室内に強力なスワールが発生する。弁体63はスワールポート29に向かって吸気がスムーズに流れるように傾斜しているため吸入空気の充填効率を向上せしめることができる。また、弁体63の下流端部63aがスワールポート29内に突出しているため、隔壁64と弁体下流端部63aとの間に渦が発生すると共にスワールポート29の流入口が絞られるため吸気の流速が増大し、斯くして燃料の霧化を向上せしめることができる。

第３図を参照すると弁軸62は挿入部42の底壁42aに形成された孔を貫通し、ダストシール71を介して底壁42aに支持され、ジョイント65と共にナット66によって共締めされる。シリンダヘッド１の共通吸入ポート56の底壁には、弁軸62およびジョイント65を突出せしめるため切り欠き部67が形成される（第３図および第６図参照）。

第７図には第５図のボートアッセンブリ34の底面図を示す。第５図および第７図を参照すると、各ジョイント65はリンク68に連結されており、リンク68の左端はピン69によってアクチュエータ70に連結されている。アクチュエータ70はダイヤフラムを内蔵しており吸気マニホルドの負圧によってリンク68を第５図中Ｈ方向（開弁方向）にまたはＣ方向（閉弁方向）に変位せしめる。リンク68は第７図に示されるようにジグザグ形状とされ、ジョイント65は互い違いにリンク68に連結される。機関低負荷時および中負荷時においては、吸気制御弁57から60は第５図および第７図に示される閉弁位置にある。機関高負荷運転時にはリンク68はＨ方向に変位し、これにより各吸気制御弁57から60は各弁軸62の周りに第７図中矢印Ｍの方向に回動して開弁位置となる。このようにジグザグ状のリンク68を用いかつジョイント65を互い違いにリンク68に連結したので単一のリンク68で全ての吸気制御弁57から60を制御することができる。

従来のように吸気制御弁をシリンダヘッド内の吸気ポート内に取付ける場合、吸気ポートと吸気制御弁との隙間が大きいとスワールの強さが低下するという問題があるので吸気制御弁によるシール性を向上せしめるために、吸気ポート内の加工精度を向上せしめる必要があるがシリンダヘッド内の吸気ポートの加工精度を上げることは困難である。本実施例ではボートアッセンブリ34の接続ポート53から56の加工精度を上げる必要があるが、この加工は比較的容易であるため所望の加工精度を得ることができる。また、弁体63は１～2mm程度の薄肉であり、接続ポート53から56内への組み付けに際しては当たりつけが行なわれる。このため、各弁体63と接続ポート53から56との隙間を小さくすることができ、これによってより強力なスワール流を得ることができる。

また、吸気制御弁57から60が組み込まれた挿入部39から42を共通吸気ポート30から33内に挿入するものであるため、吸気制御弁57から60を従来より燃焼室に近い位置に配置することができ、これによりスワールをさらに強化できる。

また、本実施例の組み付けにおいては、第３図において弁軸62を挿入部底壁42aの貫通孔から挿入した後、弁体63を弁軸62にねじ止めし、各挿入部39から42を共通吸気ポート30から33内に挿入することによって、機関への吸気制御弁57から60の組み付け作業が完了するため、機関への吸気制御弁57から60の組み付け作業性を向上せしめることができる。

第８図から第10図を参照して第２の実施例について説明する。第２の実施例は、吸気制御弁を駆動するためのリンク系がシリンダヘッドの上方にある点を除いては第１の実施例とほぼ同様である。なお第１の実施例と同様な構成要素は同一の符号で示す。

第８図および第９図を参照すると、挿入部42の上壁42bには貫通孔が形成され、弁軸62がこの挿入孔を貫通する。弁軸62上端にはワッシャ80を介して第１リンクアーム81の一端が弁軸62と一体回転するように取付けられる。第１リンクアーム81の他端は、第10図に示すように、下から順番に第１リンクアーム81、樹脂製カラー82、第２リンクアーム83の一端、樹脂製カラー84、およびワッシュ85が積み重ねられ、これらにピン86を貫通した後ワッシャ85の上にＥリング87を取り付けて抜け止めされる。従って、第１リンクアーム81と第２リンクアーム83とは相互に相対的に回転変位可能である。

アッセンブリボディ43にはサブシャフト88が配置される。サブシャフト88の下端は軸受89を介してアッセンブリボディ43の底壁に支承され、サブシャフト88の上端は

アッセンブリボディ43の頂壁を貫通し、ダストシール90を介して頂壁に支承されている。弁軸62の軸線とサブシャフト88の軸線は平行であり、これらの軸線を含む平面は各サブシャフト88の中心点を結ぶ直線し（第８図）に垂直である。サブシャフト88の上端には第３リンクアーム91の一端およびジョイント65がワッシャ92を介して一体回転するように取付けられる。第２リンクアーム83の他端は第10図と同様に樹脂製カラー84を介して第３リンクアーム91の他端にピン86によって相互に回動可能に連結される。第１リンクアーム81と第３リンクアーム91は長さが等しくかつ平行となるように配置される。ジョイント65はリンク68に連結される。第８図は弁体63が閉弁している状態を示しており、リンクが68矢印Ｈの方向に変位すると、弁体63は矢印Ｍで示される方向に回動して開弁状態となる。

本実施例ではリンク機構をシリンダヘッド１の上方に設けたので、ブローバイガス等による吸気系デポジットが接続ボート内の底壁に堆積して吸気制御弁の開閉を妨たげることを防止することができる。

また、ボートアッセンブリを組付け後例えば運搬時に、リンク系を地面等にぶつけて損傷するおそれもない。

第11図には第３の実施例を示す。この実施例では吸気制御弁はスロットル弁を兼ねている。吸気制御弁を駆動するためのリンク機構は第２の実施例と同様の４節リンク機構である。リンク68は、第１および第２の実施例のように負圧作動のアクチュエータ70によって駆動されるのではなく、アクセルペダル100に連結され、アクセルペダル100の踏み込み量に応じて駆動変位せしめられる。アクセルペダル100を踏み込むと、リンク68は第11図中Ｈ方向に変位し弁体63は第11図中Ｍ方向に変位して開度が増大する。弁体63の幅Ｗは、第１および第２の実施例より大きく、接続ボート56を全閉可能な幅とされている。弁軸62は弁体63の幅Ｗのほぼ真中に位置する。アクセルペダル100の踏み込み量が０であるとき、すなわちアイドル運転時においては弁体63は接続ボート56を全閉せしめる。このとき弁体63の下流端63aは、ヘリカルボート29側の挿入部側壁42c内壁に係合し、弁体63の上流端63bはストレートボート25側の挿入部側壁42d内壁に係合する。なおアイドル運転時における空気量を調整するために、吸気制御弁60をバイパスしてヘリカルボート29に連通されるバイパス通路（図示せず）が形成されている。ストレートボート25側挿入部側壁42d内壁面上には円筒面の一部により形成された弯曲部42eと、この弯曲部42eに続く突出した平面部42fが形成される。この弯曲部42eは、弁体上流端63bが弯曲部42eに沿って回動するように形成されている。これによりアクセルペダル100の踏み込み量の小さい部分負荷時においては、ストレートボート25側は弯曲部42eおよび平面部42fとによって閉弁状態に維持される。従って部分負荷時においてはヘリカルボート29だけから新気が燃焼室内に流入し、斯くして燃焼室内に強力なスワールを得ることができる。また、弯曲部42eおよび平面部42fを形成することによって、アクセルペダル100を踏み込み始めて弁体63が開弁し始める際、空気が急激に流入し始めることを防止することができる。これにより、低速走行時においてアクセルペダル100の踏み込み量の調整が困難になることを防止することができる。

他の挿入部39から41においても挿入部42と同様に形成されている。

以上のように本実施例においては、吸気制御弁がいわゆる独立スロットル弁としてスロットル弁をも兼ねており、従って吸気制御弁と別にスロットル弁を設ける必要がない。このため吸気損失の増大を防止することができる。

また吸気弁と吸気制御弁（スロットル弁）との間の空間容積を小さくすることができるため過渡応答性を向上せしめることができる。

なお、第１リンクアーム81および第３リンクアーム91の長さおよび取り付け角等を変えることによって、アクセルペダル100の踏み込み量の変化に対する弁体63の開度の変化を変更することができ、低速運転時のドライバビリティを向上することができる。

なお、本考案は、１つの吸気弁に対応する単一の吸気ボートがヘリカルボートとストレートボートに分割されている場合にも適用することができる。

〔考案の効果〕

吸気制御弁の機関への取り付け作業性を向上せしめつつ機関低負荷運転時に強力な旋回流を発生せしめることができる。更にアッセンブリボディの挿入部内に隔壁を形成しないようにしているのでアッセンブリボディの製造が容易であるという利点がある。また、もしアッセンブリボディの挿入部内に隔壁を形成するとこの隔壁を吸気ボート内に形成された隔壁と段差ができないように整列させる必要が生じ、その結果アッセンブリボディの製造および吸気ボートの成形に対して高い精度が要求されることになる。しかしながら本願考案ではアッセンブリボディの挿入部内に隔壁を形成しないようにしているのでアッセンブリボディの製造および吸気ボートの成形に対してさほど高い精度が要求されないという利点がある。

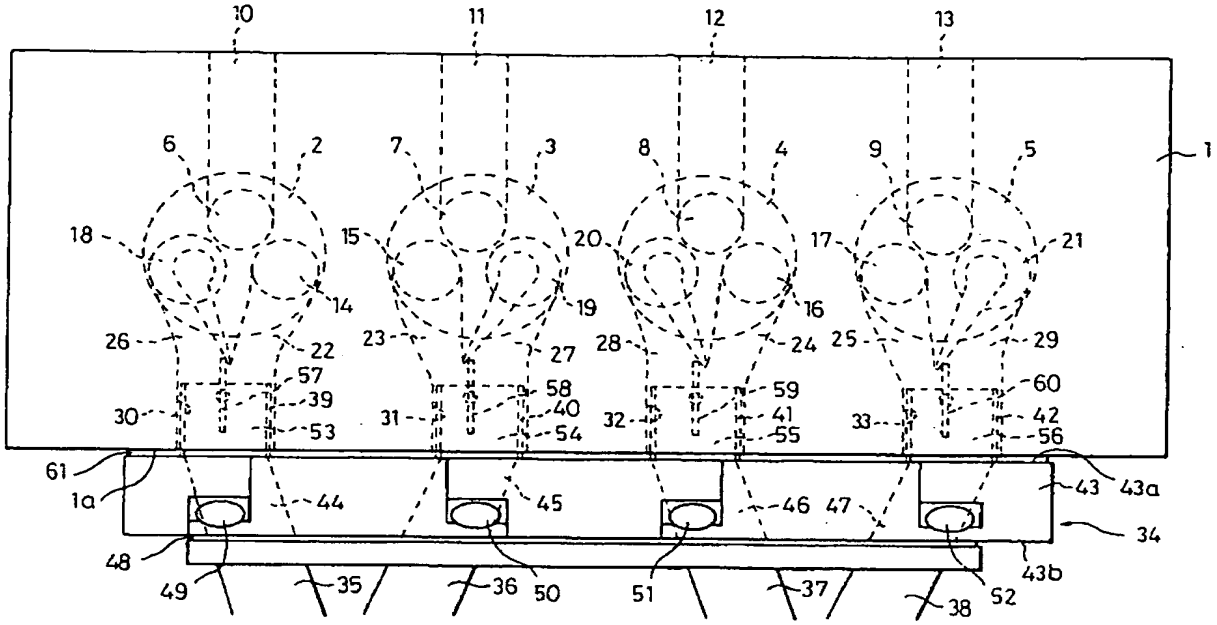
【図面の簡単な説明】

第１図は本考案の第１の実施例を適用した４気筒内燃機関の平面図、第２図はボートアッセンブリの斜視図、第３図は第１図の内燃機関の一部断面側面図、第４図は第１図に示されるアッセンブリボディを吸気マニホルド側からみた正面図、第５図は第１図のボートアッセンブリをシリンダヘッド側からみた正面図、第６図は第１図の第４気筒部の拡大断面図、第７図は第５図の底面図、第８図は第２の実施例のボートアッセンブリの拡大平面

図、第９図は第８図のポートアッセンブリの側面断面図、第10図はリンクアームの接続部の拡大断面図、第11図は第３の実施例のポートアッセンブリの一部断面の拡大平面図である。

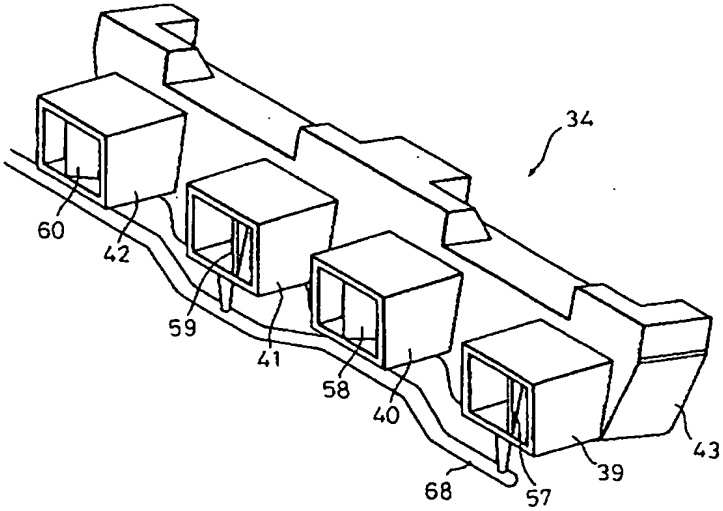
１……シリンダヘッド、22～25……ストレートポート、26～29……ヘリカルポート、34……ポートアッセンブリ、39～42……挿入部、43……アッセンブリボディ、57～60……吸気制御弁。

【第１図】

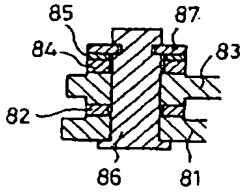


1…シリンダヘッド　　39～42…挿入部
22～25…ストレートポート　　43…アッセンブリボディ
26～29…ヘリカルポート　　57～60…吸気制御弁
34…ポートアッセンブリ

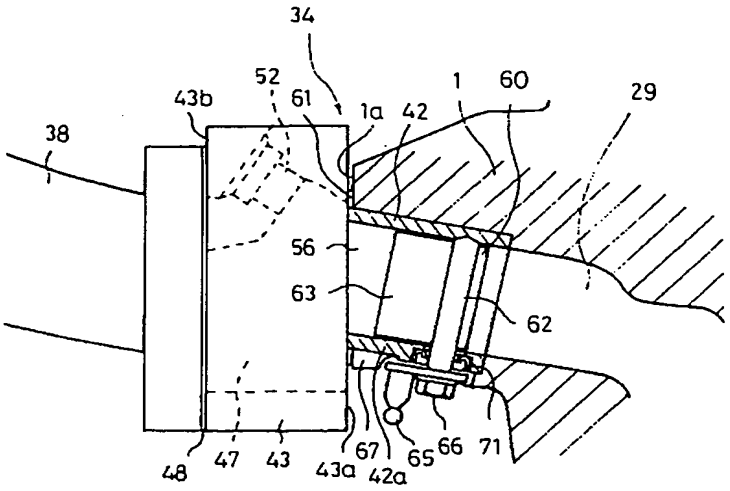
【第２図】



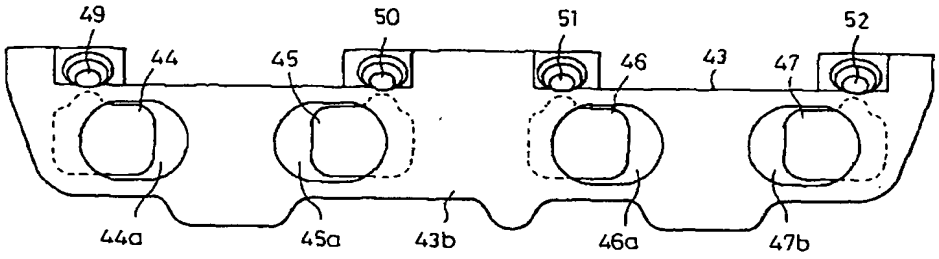
【第１０図】



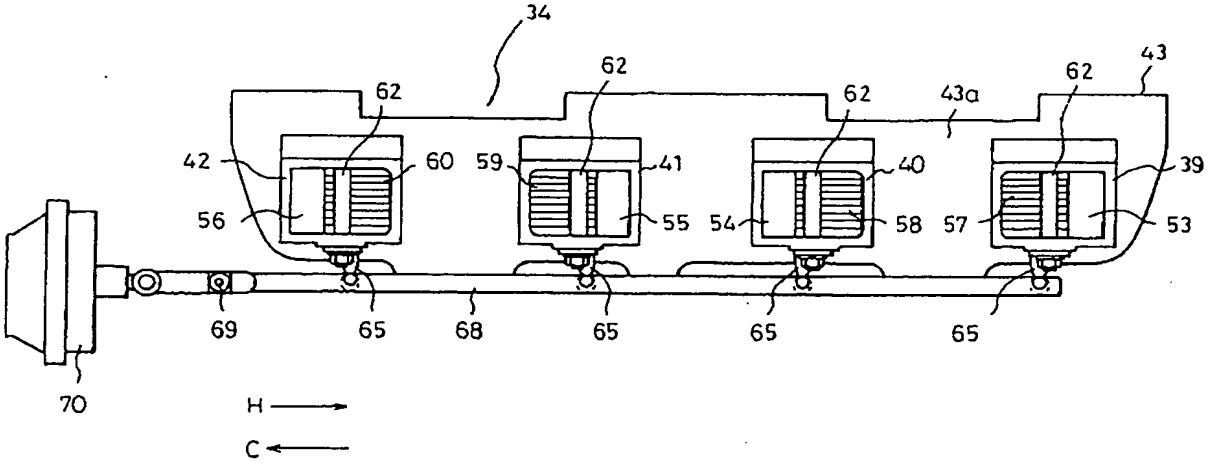
【第３図】


34
52
43b
61
1a
42
1
60
29
38
56
63
62
48
47
43
43a
67
42a
65
66
71

【第４図】


49
50
51
52
44
45
46
43
47
44a
45a
43b
46a
47b

【第５図】


34
62
62
62
62
43a
43
42
60
59
41
40
39
56
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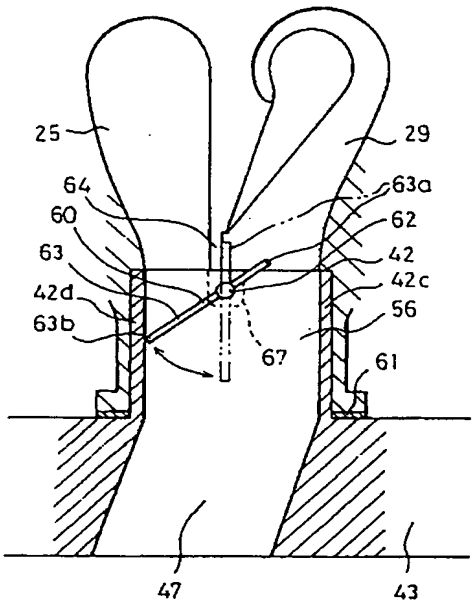
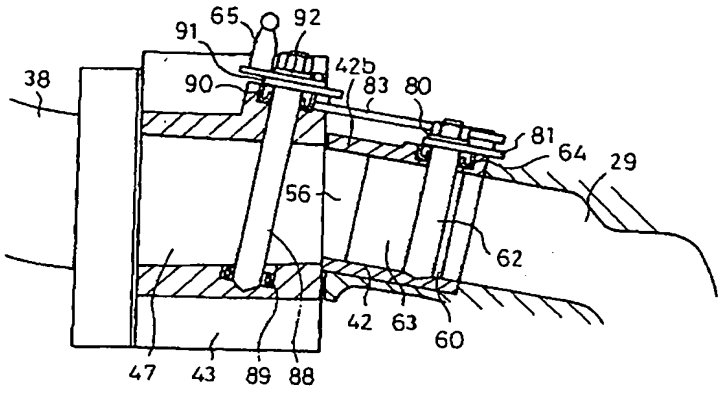
54
58
57
53
69
65
68
65
65
65
70
H
C

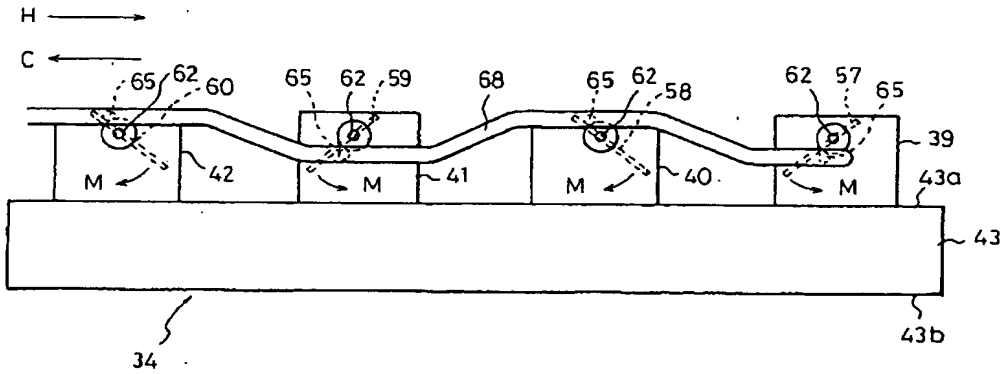
【第６図】


25
29
64
63a
60
62
63
42
42d
42c
63b
56
67
61
47
43

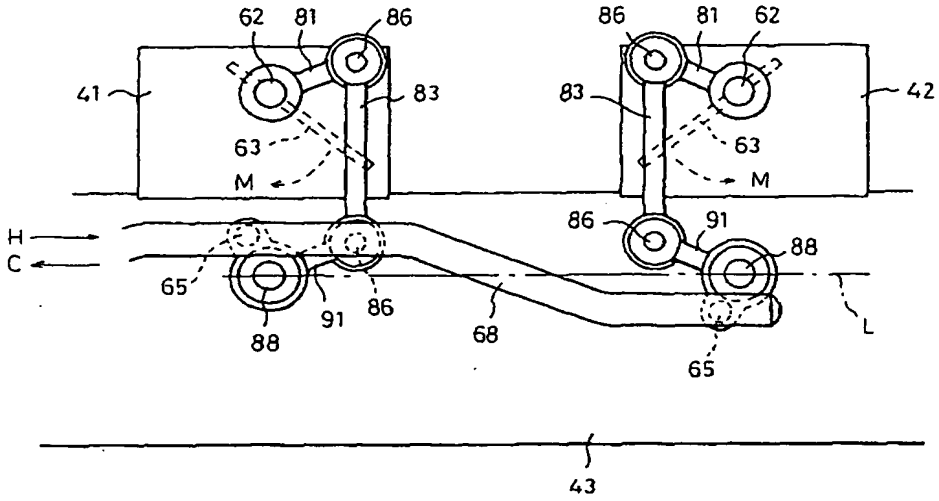
【第９図】


65
92
91
42b
38
90
83
80
81
64
29
56
62
42
63
60
47
43
89
88

【第７図】


H
C
65
62
60
65
62
59
68
65
62
58
62
57
65
39
M
42
M
41
M
40
M
43a
43
34
43b

【第８図】


62
81
86
41
83
63
M
H
C
65
88
91
86
68
86
81
62
83
42
63
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86
91
88
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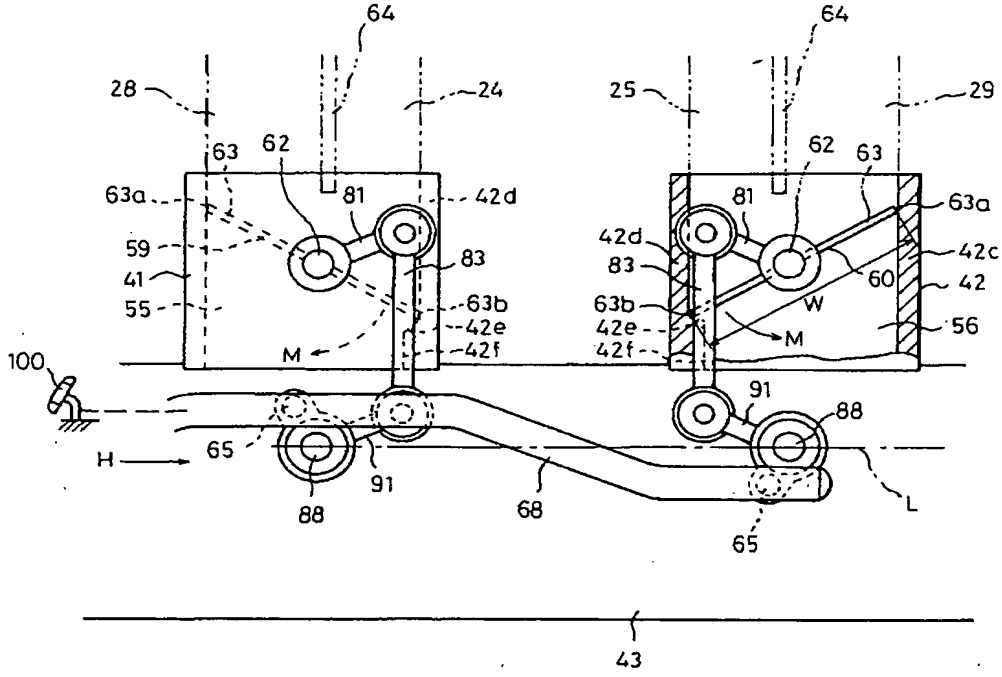
65
43

【第１１図】


64
28
24
63
62
63a
81
42d
59
83
41
55
63b
42e
42f
M
100
H
65
88
91
68
64
25
29
62
63
81
63a
42d
83
42c
60
42
63b
W
42e
42f
M
56
91
88
L
65
43